



EUROPEAN CENTRAL BANK

INDICATORS OF FINANCIAL INTEGRATION IN THE EURO AREA

SEPTEMBER 2005

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EXECUTIVE SUMMARY

The integration of Europe's financial markets is an issue of high importance for the Eurosystem. This report provides an assessment of the degree of integration in the main financial segments of the euro area, namely the money, bond, equity and banking markets. It is based on a set of financial integration indicators that will be published semi-annually on the ECB's web site. The report itself will be published annually, with the aim of documenting and monitoring the progress of financial integration in the euro area. While this first release of these indicators already covers many important dimensions of financial systems, it is the intention of the ECB to further develop the analysis in the report and the statistics in the future.

The available evidence suggests that the degree of integration varies greatly depending on the market segment. The unsecured *money market* has been fully integrated since shortly after the introduction of the euro. The repo market is highly integrated albeit to a lower extent. *Government bond markets* were significantly integrated even before the start of EMU, although some yield differentials remain. The indicators for the *corporate bond market*, which has grown considerably since the advent of the single currency, point to a high degree of integration. Progress has also been made in the integration of euroarea *equity markets*, where equity returns are increasingly determined by common factors. *Banking markets* are generally much less integrated.

I INTRODUCTION

A well integrated financial system increases the efficiency of the euro area economy by reducing the cost of capital and improving the allocation of financial resources. It also contributes to a smooth and effective implementation of monetary policy throughout the euro area. Moreover, given the strong connections between financial integration and

financial stability, a deeper financial integration may have a potential impact on the stability of the whole financial system, an area of great interest to central banks. All in all, there is substantial evidence that financial integration may ultimately support higher and more sustainable economic growth through a variety of channels. Against this background, the ECB has taken a proactive stance towards fostering European financial integration within the limits of its capabilities and competence.

This report is a new initiative by the ECB. It provides an overall assessment of the degree of financial integration in the different financial market segments of the euro area, ranging as widely as from retail lending to wholesale equity trading. It is based on a series of indicators that will be regularly updated and published on the ECB's website.

The report will be produced on an annual basis with the aim of monitoring the progress of financial integration in the euro area. The range of indicators used may be extended over time, in line with improvements in data availability and advances in research. While this first report already focuses on a number of crucial dimensions of financial systems, spanning financial and credit markets, it is the intention of the ECB to further develop the dataset in the future. In particular, it is envisaged to add indicators on some important underlying factors of integration related to financial institutions and market infrastructures. Moreover, the ECB will strive to add integration indicators for markets that could not be covered in this edition due to their relatively recent emergence.¹

¹ For example, three different phenomena can be identified. One is the degree to which the different national markets which existed *before* the launch of the euro have integrated over time. Another is the process by which new market segments originating in a particular country or financial centre have spread and integrated across Europe after the arrival of the euro. And lastly, there are some important markets that came into existence *after* the launch of the euro, but were integrated from the outset. Two significant examples of the latter phenomenon are the overnight index swap market and the market for synthetic collateralised debt obligation (CDOs). The initial set of indicators presented here does not yet cover these two relatively young markets.

The market for a given financial instrument is considered fully integrated if all economic agents with the same relevant characteristics acting in that market face a single set of rules, have equal access and are treated equally. This definition underpins the measures proposed in the report.² Two broad categories of indicators are considered: price-based indicators and quantity-based indicators. *Price-based indicators* measure discrepancies in asset prices based on their geographic origin. In a perfectly integrated market, prices of assets with similar characteristics should mostly be influenced by common euro area factors. *Quantity-based indicators* are used to investigate the extent to which investors have internationalised their portfolios. They usefully complement price-based indicators, as in financially integrated markets investors will increase their holdings of non-domestic assets to fully reap the benefits of international diversification. The indicators are either “computed” or “model-based”. Computed indicators such as standard deviations, ratios etc., are summary measures of the underlying data and are not model-specific, whereas the other indicators are derived from econometric models. Such model-based indicators have been used when computed indicators do not allow a disentangling of country effects. As these estimates depend on a specific set of modelling assumptions, they need to be interpreted with caution. In the report, the focus is on euro-denominated instruments, with particular attention being paid to price differences across euro area countries.

While analysing the developments in the indicators over time, it is worth keeping in mind that in some markets the progress in financial integration per se is not easily disentangled from the effects of the elimination of exchange rate risk and the convergence of inflation expectations across euro area countries.

The report is structured as follows. The following sections analyse money, bond, equity and banking markets. Each section presents an overall assessment of the current

degree of financial integration and discusses the evolution of the indicators in more detail. There are two annexes to this report. Annex 1 contains all of the indicators while the technical documentation for each indicator can be found in Annex 2.

2 MONEY MARKETS

The available indicators for the euro area money market point to an overall high degree of integration. The unsecured money market reached a stage of “near-perfect” integration almost immediately after the introduction of the euro. In addition, the repo market is highly integrated albeit to a lower extent.

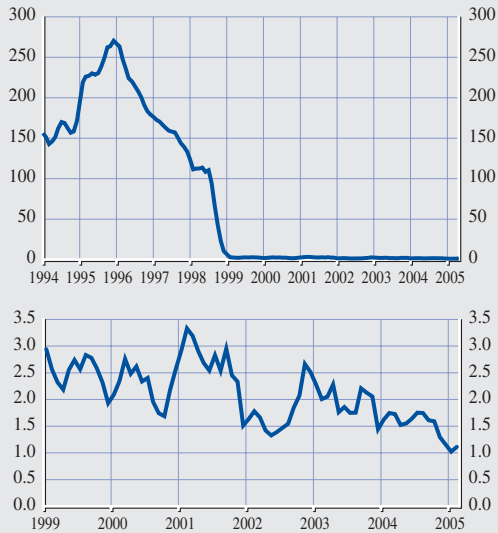
The money market, broadly defined as the market for interbank short-term debt or deposit, consists of various segments. The financial integration of the money market can be analysed on the basis of the dispersion of lending rates offered by different banks in each market segment. This section discusses indicators for the unsecured interbank market and the repo market. The data refer to actual transactions or offered rates by banks included in the panels for the EONIA (euro overnight index average), the EURIBOR (euro interbank offered rate) and the EUREPO (benchmark rate for secured money market transactions in the euro area).

Figures 1, 2 and 3 show the cross-country standard deviation for the EONIA, EURIBOR and EUREPO, respectively. According to Figures 1 and 2, the cross-sectional standard deviation of the EONIA and EURIBOR lending rates across euro area countries plummeted to close to zero following the introduction of the euro and remained stable thereafter. All these indicators paint a consistent picture of a highly integrated unsecured money market.

² For the economic and technical background to measures proposed in this report, see L. Baele, A. Ferrando, P. Hördahl, E. Krylova and C. Monnet (2004), “*Measuring financial integration in the euro area*”, ECB Occasional Paper No. 14.

Figure 1 Cross-country standard deviation of the average overnight lending rates among euro area countries

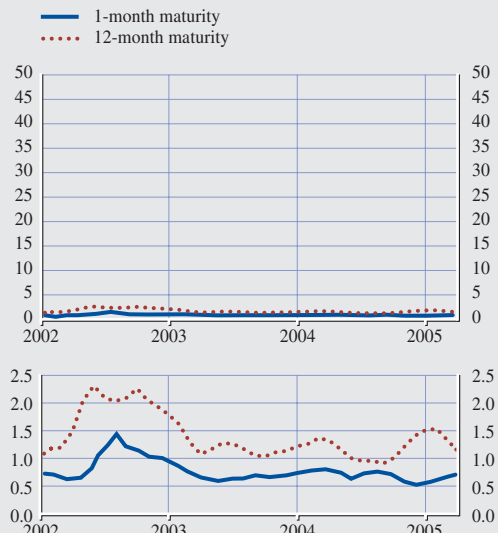
(60-day moving average; basis points)



Source: European Banking Federation, ECB calculations.

Figure 3 Cross-country standard deviation of repo rates among euro area countries

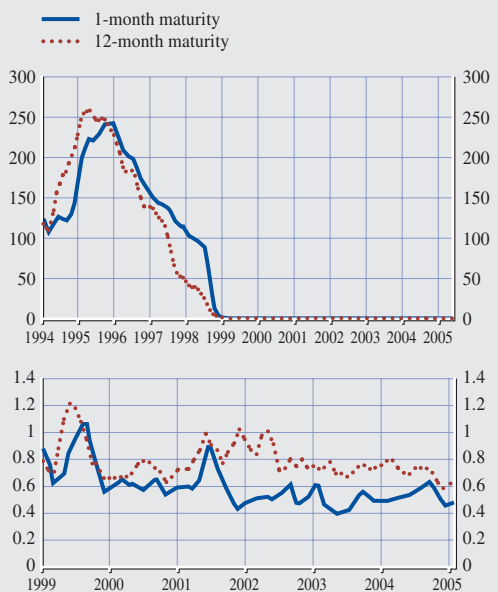
(60-day moving average; basis points)



Source: European Banking Federation, ECB calculations.

Figure 2 Cross-country standard deviation of unsecured lending rates among euro area countries

(60-day moving average; basis points)



Source: European Banking Federation, ECB calculations.

Figure 3 shows the same type of indicator as plotted in Figures 1 and 2 for the 1-month and 12-month EUREPO rate. The behaviour of the 12-month EUREPO rate indicator in particular is characterised by large movements, in part reflecting the lower liquidity of this market. The indicators suggest that there is a relatively high degree of integration also in the euro area repo market.

3 BOND MARKETS

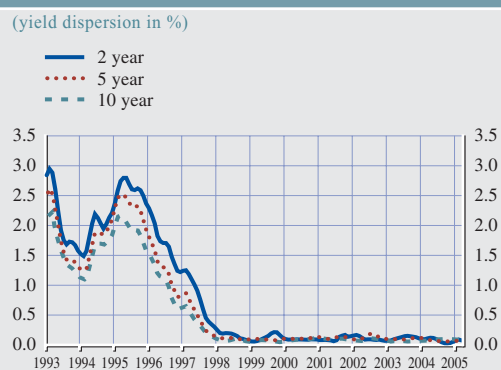
The available indicators show that with the introduction of the euro and the removal of exchange rate risk, government bond yields have converged in all euro area countries and increasingly tend to be driven by common news. However, the importance of local factors continue to have some influence. This may partly be explained by differences in liquidity and the availability of developed derivatives markets tied to the various individual bond markets. Additionally, bond yields in different countries also reflect differences in perceived credit risks. The impact of these factors, however, should not be seen as an indication of a lack of integration. The euro area corporate bond market has grown considerably in recent years. The available evidence suggests that this market is already reasonably well integrated.

3.1 GOVERNMENT BONDS

Measures of integration in government bond markets are based on yield differentials with respect to a benchmark bond (e.g., the German bond for 10-year bonds and the French bond for 2- and 5-year bonds). Given comparable maturities and other relevant characteristics, yield spreads for government bonds can provide a direct measure of the degree of integration. A simple measure is to look at developments in the standard deviation of these spreads over time: the higher the degree of integration, the lower the dispersion. In assessing this indicator, it should be borne in mind that movements related to changes in the credit risk perceptions by the market do not signal a variation in the degree of integration. In order to address this problem, additional indicators have been developed. Another commonly used measure, referred to as “beta-convergence”, is based on the economic intuition that the more integrated the market is, the more bond yields should react to common factors instead of local factors.³

Figure 4 shows the evolution over time of the standard deviations of government yield spreads over German bonds (for 10-year bonds) and French bonds (for 2- and 5-year bonds). The figure shows a significant drop in these indicators in the run-up to the EMU, which then remain close to zero from 2001 onwards (the year in which Greece joined EMU). The sharp decline of these indicators signals that the euro area government bond market has reached a very high level of integration.

Figure 4 Standard deviation of government bond yield spreads for 2-, 5- and 10-year maturities



Source: ECB.

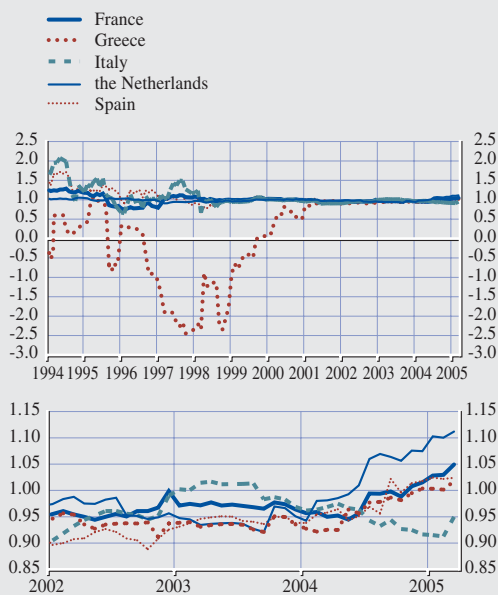
Note: As a benchmark, the German government bond yield is taken for the 10-year maturity and the French government bond yields are taken for 2- and 5-year maturities. Greece enters the standard deviation calculations for all maturities at the date of its entry to EMU.

These conclusions are confirmed by the indicators shown in Figure 5, concerning the evolution of the beta-convergence. The plotted “betas” represent the estimated correlation of changes in the 10-year government bond yield of a given country with changes in the German 10-year government bond yield. The betas varied substantially up to 1998 and converged afterwards towards 1, the perfect integration level. Greek bond yields only converged after 2001.

³ An alternative widely used measure is the “sigma-convergence”. This takes into consideration the evolution of dispersions over time in a regression analysis.

Figure 5 Evolution of beta coefficients for some selected countries

(10-year government bond yields; 18-month rolling regression)



Source: ECB.
Note: Based on a model regressing national 10-year government bond yields on benchmark German 10-year government bond yields.

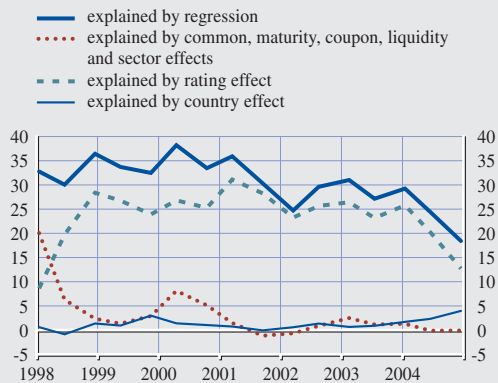
3.2 CORPORATE BONDS

The yield on a corporate bond typically depends on a number of factors, such as the credit rating, time-to-maturity, liquidity and cash-flow structure. With full integration, the impact of these specific factors should be identical across all countries. Using the same set of specific factors, it is possible to obtain measures of corporate bond market integration by investigating whether or not risk-adjusted yield spreads have a systematic country component. In an integrated market, the proportion of the total yield spread variance that is explained by country effects should be close to zero.

Following this approach the indicator shows that the euro area corporate bond market is quite well integrated. Country effects are seen to explain only a very small proportion of the cross-sectional variance of corporate bond yield spreads (see Figure 6).⁴

Figure 6 Proportion of cross-sectional variance explained by various factors

(percentages)



Source: Bloomberg and ECB calculations.

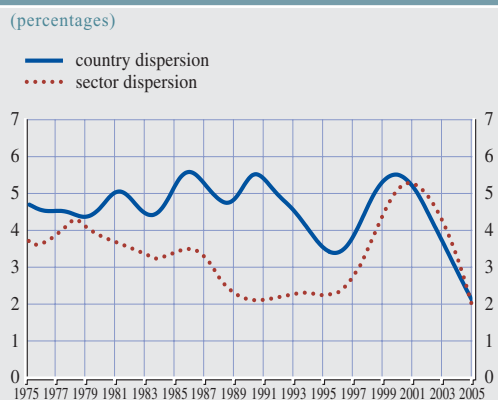
4 EQUITY MARKETS

The measures of euro area equity market integration indicate a rising degree of integration. First, since the end of 2000, the advantages of a sector diversification seem to have – for the first time in the last 30 years – surpassed those of a geographical diversification. Recent data show that this reversal was short-lived but suggest increased correlations of both country and sector returns. Second, equity returns in the euro area countries are increasingly determined by common factors. However, there appears to still be scope for further integration.

In an integrated equity market, country-specific factors should be of less importance. The more integrated the market, the greater the benefits of diversification through sector-based equity investment strategies rather than through country-based ones. By comparing the cross-sector dispersion with the cross-country dispersion of equity returns, it is therefore possible to derive indicators of financial integration.

⁴ It should be noted that the total explanatory power of the underlying regression is relatively low. This is in line with previous studies on the determinants of corporate bond risk premia.

Figure 7 Filtered country and sector dispersions of euro area equity returns

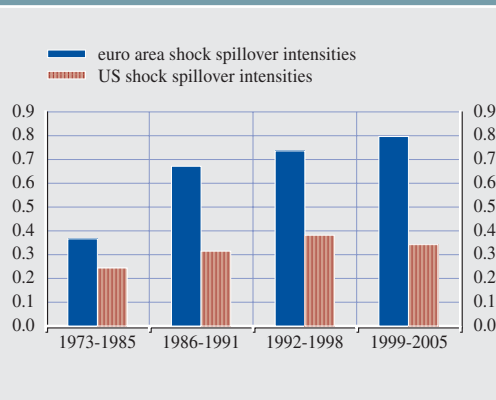


Source: Thomson Financial Datastream and ECB calculations.
 Note: The figure shows Hodrick-Prescott filtered cross-sectional dispersions of monthly euro area country and sector equity returns.

Figure 7 plots the country and sector dispersions of monthly equity returns over time. For nearly the whole sample, the country dispersion has been higher than the sector dispersion. To the extent that dispersion and correlation are inversely related, this finding suggests that a country diversification strategy has been superior to a sector diversification strategy for most of the time. The difference between country and sector dispersions narrowed in the late 1990s and the sector dispersion has even slightly exceeded the country dispersion from 2001 onwards, suggesting a possible shift in the asset allocation paradigm from country-based to sector-based strategies. However, both country and sector dispersions have strongly decreased in the most recent years. Obviously, this complicates an interpretation of the results in terms of the advantage of sector diversification relative to country diversification.

Alternative indicators of financial integration in equity markets can be derived from factor models. Under the assumption that equity returns in the euro area countries react to a local and a global factor (proxied, respectively by shocks in aggregate euro area and US equity

Figure 8 Euro area and US shock spillover intensity



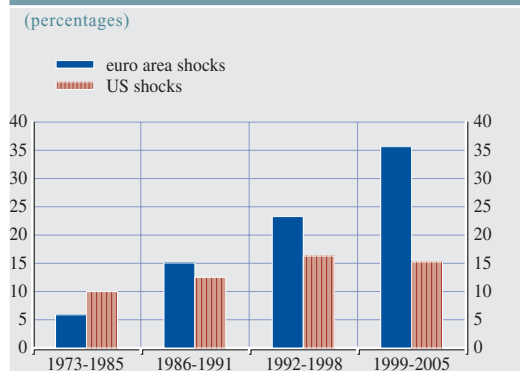
Source: Thomson Financial Datastream and ECB calculations.
 Note: For each period, the first column shows the unweighted average intensity with which euro area-wide equity market shocks, other than those from the United States, are transmitted to local euro area equity markets. The second column shows the unweighted average intensity with which US equity market shocks are transmitted to local euro area equity market returns.

markets), it is possible to estimate the intensity (beta) with which euro area and global shocks are transmitted to national equity markets. The part of local return fluctuations that is not explained by the common factors can be interpreted as the reaction to purely local news. Thus, a higher spillover intensity suggests a higher degree of equity return co-movements across countries (i.e. a higher integration).

Figure 8 shows that the average sensitivity to common shocks has increased significantly over the last decades, in particular as regards euro area-wide return shocks. This can be interpreted as an indication of increased integration of euro area equity markets. It can be noted, however, that the contemporaneous increase in US shock spillover intensities suggests that the increased integration may also be a global phenomenon. In this context, the slight decrease of US shock spillover intensities and the continued increase of euro area spillover intensities since the establishment of the euro are worth observing.

It is also possible to look at the proportion of the total domestic equity volatility that can be explained by euro area-wide and US shocks

Figure 9 Proportion of variance in local equity returns explained by euro area and US shocks



Source: Thomson Financial Datastream and ECB calculations.

Note: For each period, the first column shows the unweighted average of the relative importance of euro area-wide factors, other than US equity market shocks, for the variance in individual euro area countries' equity market returns ("variance ratio"). The second column shows the unweighted average of the relative importance of US equity market shocks for the variance in euro area equity market returns.

respectively ("variance ratios"). *Ceteris paribus*, a higher variance ratio that can be associated with euro area wide changes is an indication of a more integrated euro area equity market, signalling that national stock market returns are increasingly driven by common news. Figure 9 shows that the variance ratios

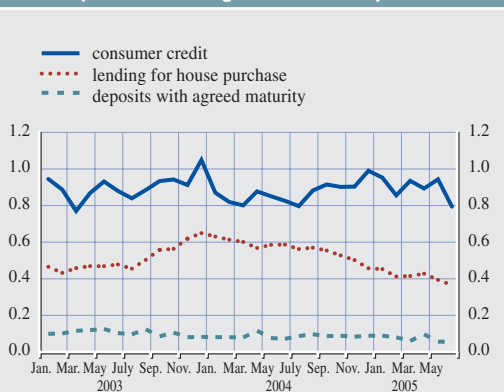
have increased over the past 30 years with respect to both euro area-wide and US shocks, although the increase has been the strongest for the former type of shocks. This suggests that regional euro area integration has proceeded more quickly than the world wide integration. However, the still relatively low level of variance explained by euro area wide factors (about 35%) reveals that local shocks are still relatively important, indicating that further integration is possible.

5 BANKING MARKETS

The available evidence suggests that the euro area banking market remains highly fragmented, as indicated by a high cross-sectional dispersion of the same types of interest rates and low cross-border banking activity. However, the euro area interbank market has shown signs of increasing integration.

Integration in the retail bank market can be measured directly by looking at the dispersion of interest rates on consumer credit, lending for house purchase and deposits with agreed maturity. Figure 10 suggests that cross-country

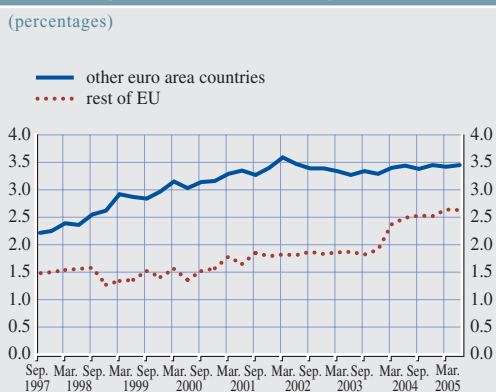
Figure 10 Cross-country standard deviation of MFI interest rates: loans to households and deposits with agreed maturity



Source: ECB.

Note: The measure is based on MFI interest rates on new business.

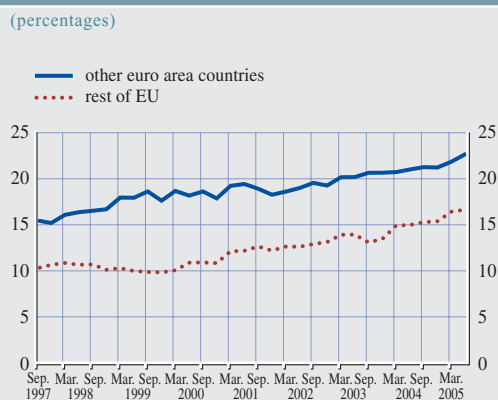
Figure 11 MFI loans to non-MFIs: outstanding amounts by residency of the counterparty as a share of total loans granted by MFIs, excluding the Eurosystem



Source: ECB.

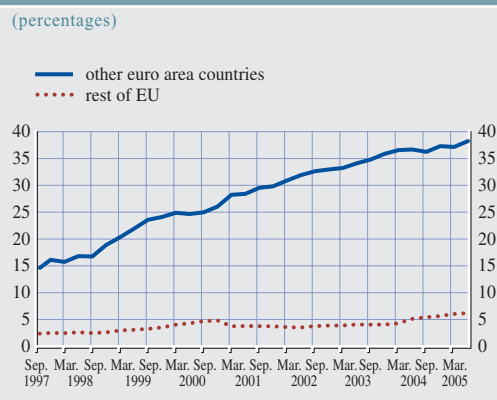
Note: This indicator displays the geographical counterparty diversification of loans granted by euro area MFIs to non-MFI counterparties resident in other euro area countries and non-euro area EU Member States.

Figure 12 MFI loans to MFIs: outstanding amounts by residency of the counterparty as a share of total loans granted by MFIs, excluding the Eurosystem



Source: ECB.
 Note: This indicator displays the geographical counterparty diversification of loans granted by euro area MFIs to MFI counterparties resident in other euro area countries and non-euro area EU Member States.

Figure 13 MFI holdings of securities issued by non-MFIs: outstanding amounts by residency of the issuer as a share of total holdings, excluding the Eurosystem



Source: ECB.
 Note: The indicator shows securities held by euro area MFIs and issued by non-MFIs resident in other euro area countries and non-euro area EU Member States.

dispersions of bank interest rates have remained relatively high (compared, for example, with the government bond market) since January 2003.⁵ However, this may not only be due to an incomplete integration. The ECB, together with the NCBs is undertaking a comprehensive analysis of cross-country interest rate dispersion.

Looking at the share of cross-border activity in the total lending activity of MFIs, these findings are broadly confirmed. Cross-border retail bank lending activity in the euro area remains very limited (around 3.5% of the total), suggesting a fragmented retail banking market (see Figure 11).

Although domestic loans still account for more than 50% of the total, the euro area interbank market has shown signs of increasing integration as cross-border activity among the euro area countries has increased substantially (see Figure 12). Furthermore, the share of MFIs' holdings of non-domestic (euro area in particular) securities in total holdings has increased markedly in recent years, which points to a higher degree of capital market integration in the euro area (see Figure 13).

5 Data prior to 2003 could be shown once historical standardised MFI interest rate data become available. Using unharmonised data available up to January 2003, L. Baele, A. Ferrando, P. Hördahl, E. Krylova and C. Monnet (2004) showed that cross-country dispersions of bank interest rates have declined somewhat since the early 1990s (partly due to the strong convergence of inflation rates). Analogous to developments in government bond yields, the declining trend has come to a halt in recent years, which may point to a slowdown in the process of integration in this market segment.

ANNEX I INDICATORS OF FINANCIAL INTEGRATION

Money market indicators				
N	Indicator	Description	Computed/model-based	Sources
1	Cross-country standard deviation of the average overnight lending rates among euro area countries	The measure is based on average overnight rates for each of the euro area countries, as reported by EONIA banks	Computed	EBF/ECB
2	Cross-country standard deviation of unsecured lending rates among euro area countries	The measure is based on the unsecured 1- and 12-month lending rates	Computed	EBF
3	Cross-country standard deviation of repo rates among euro area countries	Based on the quotes reported by EUREPO panel banks for 1- and 12-month repo rates	Computed	EBF
Government bond market indicators				
4	Standard deviation of government bond yield spreads for 10-year maturity	Based on euro area country yields on 10-year government bonds	Computed	ECB
5	Standard deviation of government bond yield spreads for 2- and 5-year maturities	Based on euro area country yields on 2- and 5-year government bonds	Computed	ECB
6	Evolution of beta coefficients	Based on 18-months rolling regression of changes in country yields for 10-year government bonds with respect to changes in yields on the benchmark (German) 10-year government bond	Model-based	ECB
7	Average distance of intercept/beta from values implied by complete integration	Based on the same model as indicator 9	Model-based	ECB
8	Variance ratio	Based on the same model as indicator 9	Model-based	ECB



Corporate bond market indicators

N	Indicator	Description	Computed/model-based	Sources
9	Proportion of cross-sectional variance explained by various factors	Based on the Merrill Lynch EMU corporate bond index. The measure is derived by running a regression of spreads relative to a set of variables including rating	Model-based	Bloomberg
10	Estimated coefficients of country dummies	Based on the same model as indicator 12	Model-based	Bloomberg
11	Cross-sectional dispersion of country parameters	Based on the same model as indicator 12	Model-based	Bloomberg

Equity market indicators

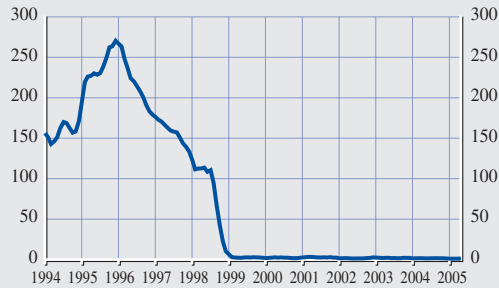
12	Filtered country and sector dispersions of euro area equity returns	Based on monthly cross-sectional Hodrick-Prescott filtered total equity returns on country and sector indexes	Model-based	Thomson Financial Datastream
13	Euro area and US shock spillover intensity	The indicator is derived from a model specifying euro area-wide and US (global) shocks to estimate the average sensitivities of country returns to common factors	Model-based	Thomson Financial Datastream
14	Proportion of variance in local equity returns explained by euro area and US shocks	The indicator is derived from a model specifying euro area-wide and US (global) shocks to estimate the proportion of total domestic equity volatility explained by common factors	Model-based	Thomson Financial Datastream

Banking market indicators				
N	Indicator	Description	Computed/model-based	Sources
15	Cross-country standard deviation of MFI interest rates on loans to non-financial corporations	Based on MFI (monetary financial institutions) interest rate statistics	Computed	ECB
16	Cross-country standard deviation of MFI interest rates on loans to households and deposits with agreed maturity	Based on MFI interest rate statistics	Computed	ECB
17	MFI loans to non-MFIs: outstanding amounts by residency of the counterparty as a share of total loans granted by MFIs, excluding the Eurosystem	Based on BSI (balance sheet items) statistics	Computed	ECB
18	MFI loans to MFIs: outstanding amounts by residency of the counterparty as a share of total loans granted by MFIs, excluding the Eurosystem	Based on BSI statistics	Computed	ECB
19	MFI holdings of securities issued by non-MFIs: outstanding amounts by residency of the issuer as a share of total holdings, excluding the Eurosystem	Based on BSI statistics	Computed	ECB
20	MFI holdings of securities issued by MFIs: outstanding amounts by residency of the issuer as a share of total holdings, excluding the Eurosystem	Based on BSI statistics	Computed	ECB

MONEY MARKET

Chart 1 Cross-country standard deviation of the average overnight lending rates among euro area countries

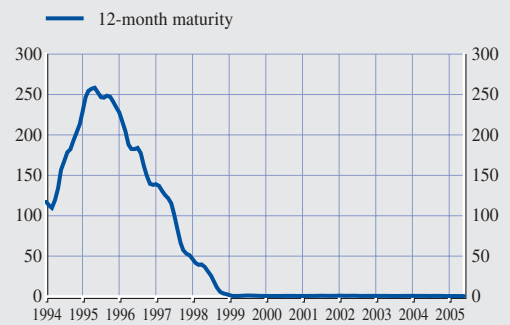
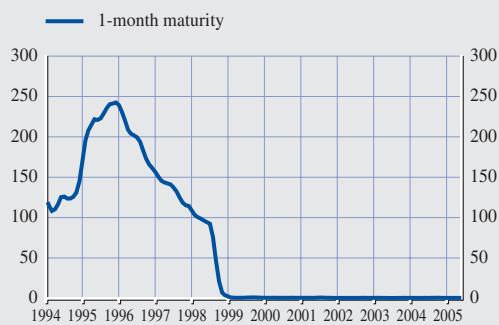
(60-day moving average; basis points)



Source: European Banking Federation, ECB calculations.

Chart 2 Cross-country standard deviation of unsecured lending rates among euro area countries

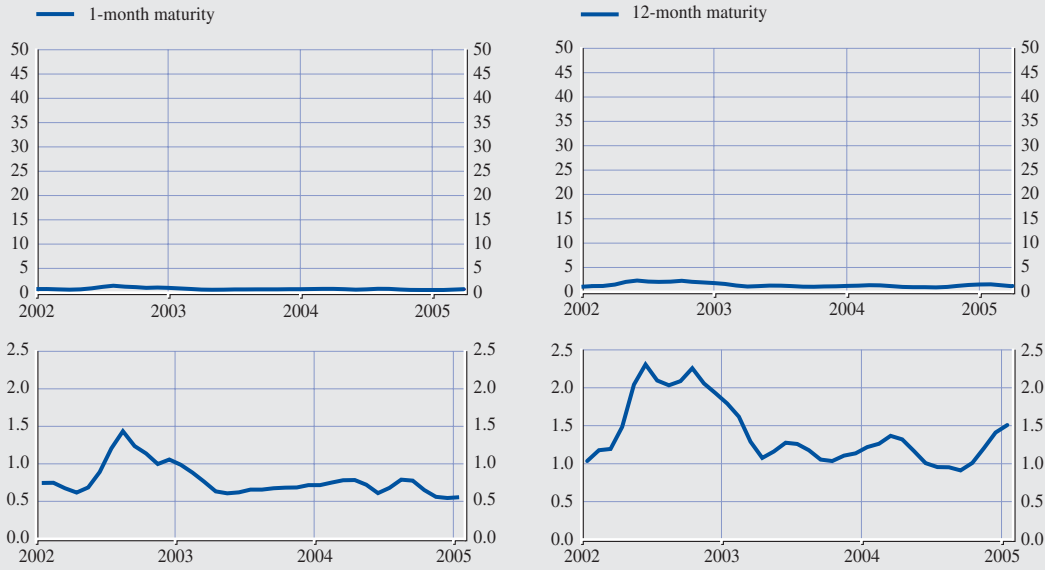
(60-day moving average; basis points)



Source: European Banking Federation, ECB calculations.

Chart 3 Cross-country standard deviation of repo rates among euro area countries

(60-day moving average; basis points)



Source: European Banking Federation, ECB calculations.

GOVERNMENT BOND MARKET

Chart 4 Standard deviation of government bond yield spreads for 10-year maturity

(yield dispersion in %)

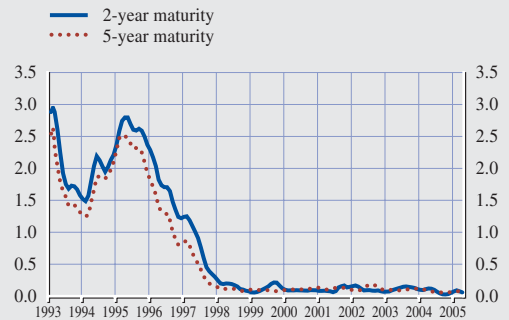


Source: ECB.

Note: As a benchmark, the German government bond yield is taken. Greece enters the standard deviation calculations for all maturities at the date of its entry to EMU.

Chart 5 Standard deviation of government bond yield spreads for 2- and 5-year maturities

(yield dispersion in %)

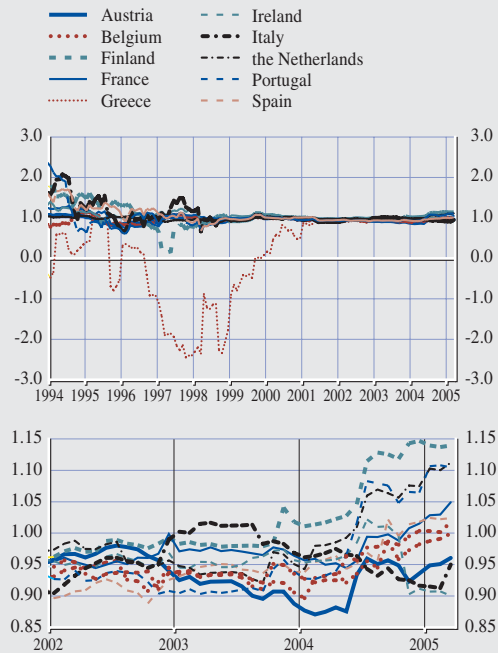


Source: ECB.

Note: As a benchmark, the yield on French government bonds is taken. Greece enters the standard deviation calculations for all maturities at the date of its entry to EMU.

Chart 6 Evolution of beta coefficients

(10-year government bond yields; 18-month rolling regression)

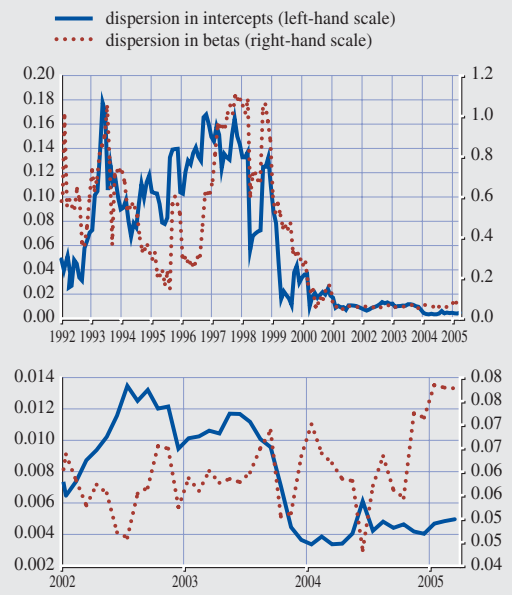


Source: ECB.

Note: Based on a model regressing national 10-year government bond yields on benchmark German 10-year government bond yields.

Chart 7 Average distance of intercept/beta from values implied by complete integration

(10-year government bond yields; 18-month rolling regression)

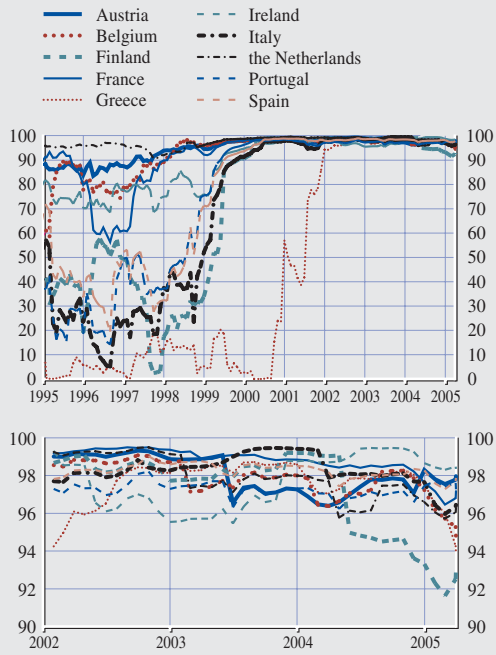


Source: ECB.

Note: See Chart 6.

Chart 8 Variance ratio

(10-year government bond yields; 18-month rolling regression)



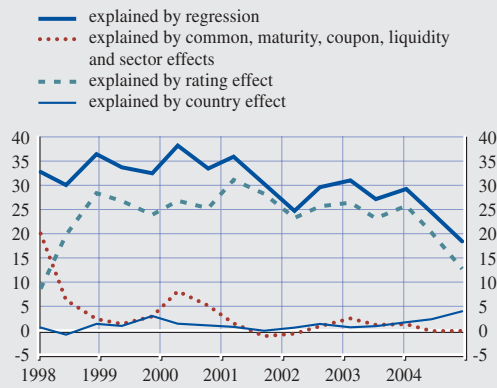
Source: ECB.

Note: See Chart 6. Proportion of the variance of national 10-year government bond yields that is explained by the variance in the benchmark German 10-year government bond yield.

CORPORATE BOND MARKET

Chart 9 Proportion of cross-sectional variance explained by various factors

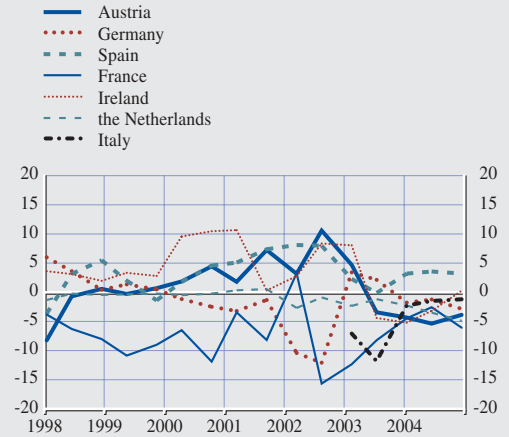
(6-month averages; percentages)



Sources: Bloomberg and ECB calculations.

Chart 10 Estimated coefficients of country dummies

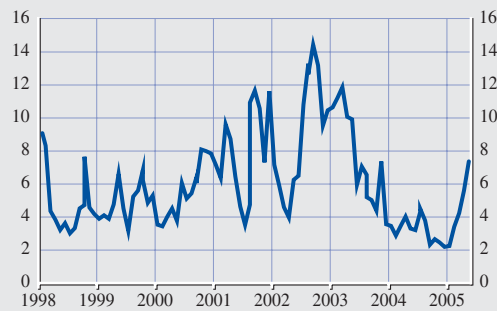
(6-month averages)



Sources: Bloomberg and ECB calculations.

Chart 11 Cross-sectional dispersion of country parameters

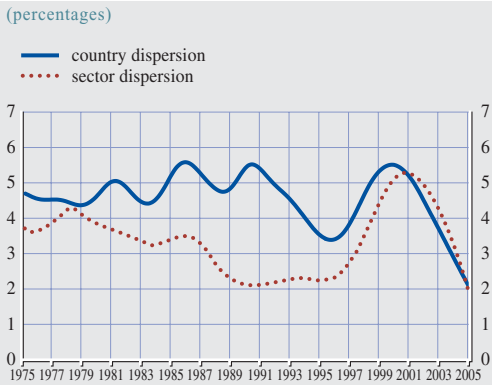
(basis points)



Sources: Bloomberg and ECB calculations.

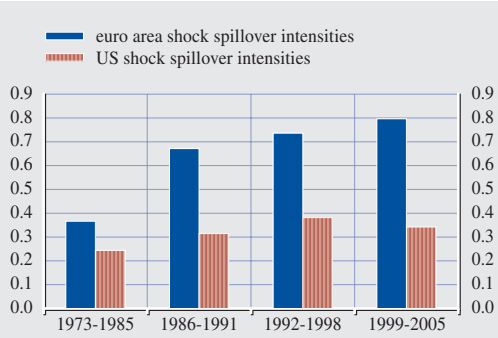
EQUITY MARKET

Chart 12 Filtered country and sector dispersions of euro area equity returns



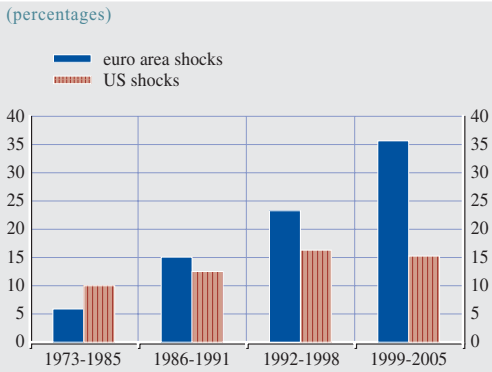
Source: Thomson Financial Datastream and ECB calculations.
 Note: The chart shows Hodrick-Prescott filtered cross-sectional dispersions of monthly euro area country and sector equity returns.

Chart 13 Euro area and US shock spillover intensity



Source: Thomson Financial Datastream and ECB calculations.
 Note: For each period, the first column shows the unweighted average intensity with which euro area-wide equity market shocks, other than those from the United States, are transmitted to local euro area equity markets. The second column shows the unweighted average intensity with which US equity market shocks are transmitted to local euro area equity market returns.

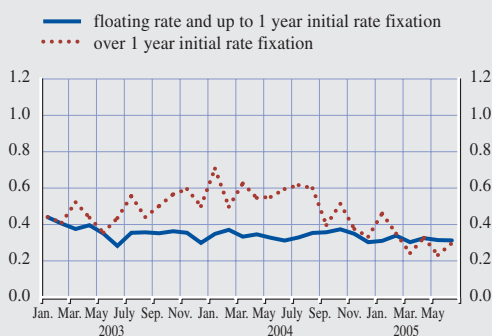
Chart 14 Proportion of variance in local equity returns explained by euro area and US shocks



Source: Thomson Financial Datastream and ECB calculations.
 Note: For each period, the first column shows the unweighted average of the relative importance of euro area-wide factors, other than US equity market shocks, for the variance in individual euro area countries' equity market returns ("variance ratio"). The second column shows the unweighted average of the relative importance of US equity market shocks for the variance in euro area equity market returns.

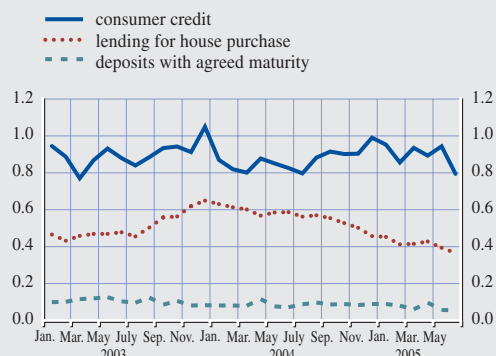
BANKING MARKET

Chart 15 Cross-country standard deviation of MFI interest rates on loans to non-financial corporations



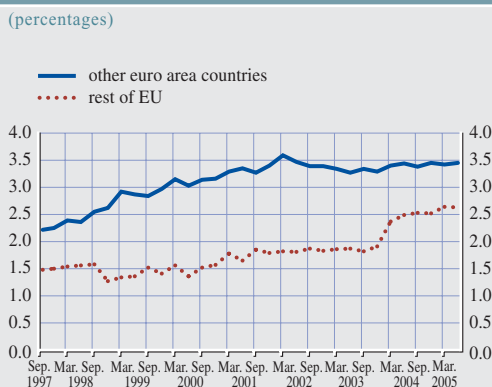
Source: ECB.
Note: The measure is based on MFI interest rates on new business.

Chart 16 Cross-country standard deviation of MFI interest rates on loans to households and deposits with agreed maturity



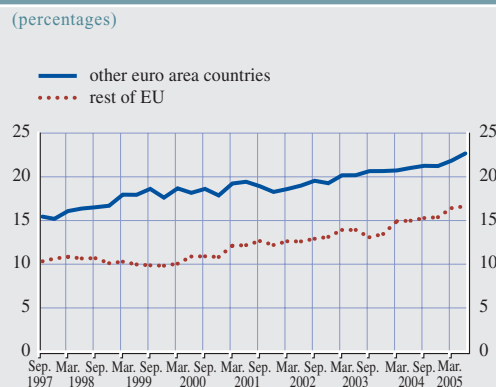
Source: ECB.
Note: The measure is based on MFI interest rates on new business. Deposits with agreed maturity include deposits from non-financial corporations and households.

Chart 17 MFI loans to non-MFIs: outstanding amounts by residency of the counterparty as a share of total loans granted by MFIs, excluding the Eurosystem



Source: ECB.
Note: This indicator displays the geographical counterparty diversification of loans granted by euro area MFIs to non-MFI counterparties in other euro area countries and non-euro area EU Member States.

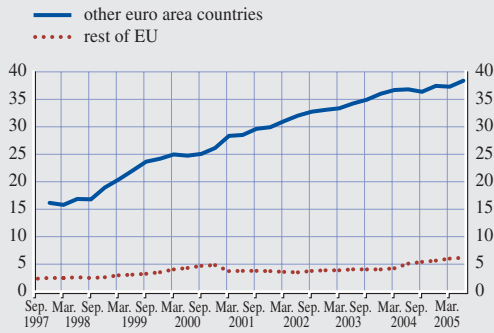
Chart 18 MFI loans to MFIs: outstanding amounts by residency of the counterparty as a share of total loans granted by MFIs, excluding the Eurosystem



Source: ECB.
Note: This indicator displays the geographical counterparty diversification of loans granted by euro area MFIs to MFI counterparts resident in other euro area countries and non-euro area EU Member States.

Chart 19 MFI holdings of securities issued by non-MFIs: outstanding amounts by residency of the issuer as a share of total holdings, excluding the Eurosystem

(percentages)

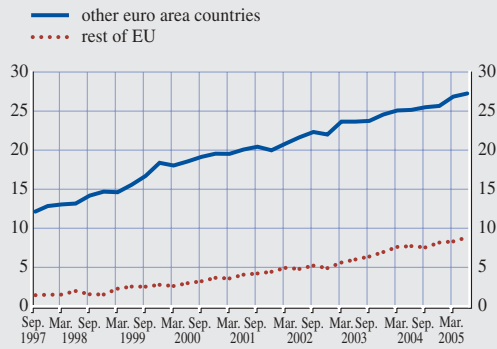


Source: ECB.

Note: The indicator shows securities held by euro area MFIs and issued by non-MFIs resident in other euro area countries and non-euro area EU Member States.

Chart 20 MFI holdings of securities issued by MFIs: outstanding amounts by residency of the issuer as a share of total holdings, excluding the Eurosystem

(percentages)



Source: ECB.

Note: The indicator shows securities held by euro area MFIs and issued by MFIs resident in other euro area countries and non-euro area EU Member States.

ANNEX 2 METHODOLOGICAL NOTES¹

MONEY MARKET INDICATORS (INDICATORS I-3)

COMPILATION

The ECB avails itself of business frequency (daily) data at the level of individual institutions for both unsecured and secured interbank short-term debt or deposits. The data are made available by the European Banking Federation (EBF) and cover the EONIA and EURIBOR (unsecured lending) as well as the EUREPO² for different maturities.

For each dataset, the indicator is the unweighted standard deviation (D_t) of the average daily interest rates prevailing in each euro area country. The number of euro area countries (n in the formula below) reflects the number of countries having adopted the euro in the reference period:

$$D_t = \sqrt{\frac{1}{n} \sum_c (r_{c,t} - r_t)^2} \quad (1)$$

where $r_{c,t}$ is the unweighted average of the interest rate $r_{i,t}^c$ reported by each of the m_c panel banks at time t in a given country c :

$$r_{c,t} = \frac{1}{m_c} \sum_i r_{i,t}^c \quad (2)$$

The euro area average r_t is calculated as the unweighted average of the average interest rates $r_{c,t}$.

The data are smoothed by calculating a 60-(business) day centred moving average of the standard deviation, transformed into monthly figures taking the end-of-month observation of the smoothed series.

ADDITIONAL INFORMATION

The individual rates of the banks of the EONIA panel are collected by the ECB on behalf of the European Banking Federation. Every day on which TARGET (the Trans-European Automated Real-Time Gross Settlement Express Transfer system) is open, each EONIA panel bank reports to the ECB its aggregate volume of intra-day unsecured lending transactions and the weighted average lending rate for these transactions. All lending

transactions carried out before the closing of TARGET at 6.00 p.m. (C.E.T.) have to be reported. The panel of reporting banks includes only the most active banks located in the euro area and beyond. Reported bid rates are considered to be national rates of country X, if the reporting bank has its headquarters in country X. However, the counterparty of the transaction is not known and the reported interest rate could actually (in part) refer to transactions with a bank outside country X.

EURIBOR and EUREPO rates do not relate to transactions conducted during the day but are indicative rates quoted by banks which are members of the respective panels. Every panel bank delivers its quotations for these instruments directly to Moneyline Telerate no later than 10.45 a.m. (C.E.T.) on each day that TARGET is open. Moneyline Telerate is not responsible for computing the aggregate EURIBOR and EUREPO indices and for providing the underlying data to the EBF. Data for EUREPO rates start in March 2002 when the EUREPO index was introduced.

- 1 For additional technical background, see L.Baele, A. Ferrando, P. Hördahl, E. Krylova and C. Monnet (2004), "Measuring financial integration in the euro area", ECB Occasional Paper No. 14.
- 2 EONIA stands for euro overnight index average. It is the effective overnight reference rate for the euro and is computed as a weighted average of all overnight unsecured lending transactions undertaken in the interbank market, initiated within the euro area by the contributing banks. The EONIA is computed with the help of the European Central Bank. The banks contributing to the EONIA are the same as the EURIBOR panel banks (composed of banks resident in the euro area and in other EU Member States as well as some international banks). The EURIBOR (euro interbank offered rate) is the benchmark rate of the large euro money market that has emerged since 1999. The EUREPO is the benchmark rate of the euro repo market that has emerged subsequent to the introduction of the euro in 1999. It is the rate at which one prime bank offers funds in euro to another prime bank when the funds are secured by a repo transaction using general collateral. For further information, see <http://www.euribor.org/default.htm> and <http://www.eurepo.org/>.

GOVERNMENT BOND MARKET INDICATORS (INDICATORS 4-8)

Standard deviations of government bond yield spreads (indicators 4-5)

COMPILATION

The cross-country standard deviations of government bond yield spreads for 2-, 5- and 10-year maturities are calculated on the basis of daily data for the government bond yield spreads relative to the government bond yield in the country selected as a benchmark for the calculation (Germany for the 10-year maturities and France for 2- and 5-year maturities). The standard deviation (S_t) takes the following form:

$$S_t = \sqrt{\frac{1}{n} \sum_c (y_{c,t} - y_{b,t})^2} \quad (3)$$

where $y_{c,t}$ denotes the yield on the government bond of euro area country c with the relevant maturity on day t and $y_{b,t}$ is the yield on the government bond of the country selected as a benchmark for that maturity (i.e. Germany or France).

In the second step, data are smoothed by calculating a 60-(business) day centred moving average of the standard deviation, transformed into monthly figures taking the end-of-month observation of the smoothed series.

The standard deviation of 10-year government bond yield spreads is based on bonds from Belgium, Greece, Spain, France, Ireland, Italy, the Netherlands, Austria, Portugal and Finland. For the 5-year maturity, the government bonds of Belgium, Germany, Greece, Spain, Ireland, Italy, the Netherlands, Austria, Portugal and Finland are used. For the 2-year maturity, the measure is based on bonds from Belgium, Germany, Greece, Spain, Italy, the Netherlands, Austria, Portugal and Finland. Greece enters the standard deviation calculations for all maturities at the date of its entry to EMU. For Luxembourg no benchmark bond for the residual maturity of close to two, five or ten years exists.

ADDITIONAL INFORMATION

Not all government debt in the euro area is fully substitutable as regards, e.g. perceived credit risk or liquidity of the relevant bonds. This might affect the yields on the selected bonds and thus the computed indicator.

Evolution of beta coefficients (indicator 6)

COMPILATION

If bond markets are fully integrated and country-specific changes in perceived credit risks do not occur, bond yields should only react to news common to all markets. That is, changes in the bond yields of individual countries should react exclusively to common news, which is reflected in a change of the benchmark government bond yield. To separate common from local influences, the following regression is run:

$$\Delta R_{c,t} = \alpha_{c,t} + \beta_{c,t} \Delta R_{ger,t} + \varepsilon_{c,t} \quad (4)$$

where α denotes a country- and time-varying intercept; β is a country- and time-dependent beta with respect to the benchmark (German) bond yield; ΔR is the change in the bond yield and ε is a country-specific shock.

The conditional betas are derived by estimating the above regression using the first 18 months of monthly averages. Subsequently, the data window is moved one month ahead and the equation is re-estimated, until the last observation is reached. A time series for $\beta_{c,t}$ is thus obtained.

ADDITIONAL INFORMATION

The outcome of the econometric specification depends on the selection of the most appropriate benchmark bond, in this case the 10-year German government bond. In addition, one should not expect that common factors fully explain changes in local bond yields as "local news" concerning credit and liquidity risks will continue to have an impact on local yields.

Average distance of intercept/beta from values implied by complete integration (indicator 7)

COMPILATION

This indicator is derived using regression (4), as for the previous indicator. From the individual country regressions, the unweighted average $\alpha_{c,t}$ and $\beta_{c,t}$ values are calculated and measured in proportion to the values implied by complete market integration (0 and 1, respectively). The analysis is based on monthly averages of government bond yields.

ADDITIONAL INFORMATION

Same as for indicator 9.

Variance ratio (indicator 8)

COMPILATION

This indicator measures the proportion of the variance in local (country-specific) yields that is explained by the variance in the benchmark (German) 10-year government bond yield; i.e. the “variance ratio”. The indicator is derived from the same 18-month rolling regression as for the previous two indicators (see equation (4) above). The total variance in local yields is given by

$$\text{Var}(\Delta R_{c,t}) = \beta_{c,t}^2 \text{Var}(\Delta R_{b,t}) + \text{Var}(\varepsilon_{c,t}) \quad (5)$$

and the variance ratio by:

$$VR_{c,t} = \frac{\beta_{c,t}^2 \text{Var}(\Delta R_{b,t})}{\text{Var}(\Delta R_{c,t})} \quad (6)$$

Hence, a variance ratio close to one is obtained when the beta approaches one and when the volatilities of the local and the benchmark bond yield changes are of a similar magnitude. The analysis is based on monthly averages of government bond yields.

ADDITIONAL INFORMATION

Same as for indicators 9 and 10.

CORPORATE BOND MARKET (INDICATORS 9-11)

Proportion of cross-sectional variance explained by various factors (indicator 9)

COMPILATION

This indicator is derived by estimating the following equation using an Ordinary Least Squares (OLS) technique:

$$SP_{c,r}^i(\tau, t, z_t) = \alpha_t + \sum_{r=1}^K \gamma_{r,t} CR_{i,t}^r + \sum_{s=1}^2 \delta_{s,t} S_{i,t}^s + \varphi_t z_t^i + \sum_{c=1}^N \beta_{c,t} C_{i,c,t} + \varepsilon_{i,t} \quad (7)$$

where $SP_{c,r}^i(\tau, t, z_t)$ is the yield spread for corporate bond i at time t issued in country c with τ years to maturity, with credit rating r and set of instruments z_t . α is an intercept common to all corporate bonds, $CR_{i,t}^r$ is a rating dummy which takes a value of one when corporate bond i belongs to rating category r at time t and zero otherwise, and $S_{i,t}^s$ is a sector dummy which takes a value of one for financial corporations and zero for non-financial corporations. The parameter vector φ groups the sensitivities of the various corporate bonds to the instruments contained in z_t^i , namely time-to-maturity, liquidity and coupon of the i th bond. As a proxy of liquidity, we use the ratio of the number of days that the bond has been traded to the total number of trading days within every time interval. $C_{i,c,t}$ is a country dummy that equals one when corporate bond i belongs to country c at time t , and zero otherwise.

The sample is composed of 1,990 individual bonds that are used in the Merrill Lynch EMU corporate bond index, which incorporates euro-denominated investment-grade bonds with a minimum size of issue of €100 million. Bonds rated below investment grade and asset-backed bonds are excluded from the analysis. In addition, bonds with less than one year to maturity and bonds which were traded less than once per week in a given four-week time interval were excluded. All euro-denominated bonds not issued in a euro area country were eliminated as well as data for countries that do not have at least

ten corporate bonds in every time interval. Thus, the analysis is based on a sample of bonds issued in seven countries: Austria, France, Germany, Ireland, Italy, the Netherlands and Spain. Italy has been included in the regression analysis from June 2003.

The indicator represents the proportion of cross-sectional variance explained by the various components (common, rating, sector, maturity, liquidity coupon and country effects) over time.

Estimated coefficients of country dummies over time (indicator 10)

COMPILATION

As a test for integration, we test whether the country parameters $\beta_{c,t}$ in equation (7) are zero, or at least converge towards zero.

Cross-sectional dispersion of country parameters (indicator 11)

COMPILATION

This indicator is derived by calculating the average size of the estimated country dummies derived from regression (7). An overall decrease in the dispersion of the country effects would be an indication of increasing integration of the corporate bond market.

ADDITIONAL INFORMATION

Before June 2003 the indicators were calculated without Italy.

EQUITY MARKET INDICATORS (INDICATORS 12-14)

Filtered country and sector dispersions of euro area equity returns (indicator 12)

COMPILATION

This indicator is derived by calculating the cross-sectional dispersion of both sector and country index returns for the euro area countries.³ Data refer to the EMU global sector indices provided by Datastream and are calculated on a weekly basis from January 1973

onwards. They include (reinvested) dividends and are denominated in euro.

The cross-sectional dispersions are filtered using the Hodrick-Prescott smoothing technique, which provides a smooth estimate of the long-term trend component of the series.

ADDITIONAL NOTES

The indicator is useful for uncovering structural changes in the aggregate euro area equity market, but is less informative about such changes in individual markets.

Euro area and US shock spillover intensity (indicator 13)

COMPILATION

This measure is equivalent to the bond market news-based indicators (e.g. indicator 9). However, empirical evidence suggests that equity returns are significantly driven by global factors. For that reason, both euro area-wide shocks and US shocks (as a proxy for global factors) are included in the assessment of common news.

To calculate the relative importance of euro area-wide and US stock market fluctuations for local stock market returns, the stock market returns of individual countries are modelled as having an expected component, and an unexpected component, $\varepsilon_{c,t}$.⁴ The unexpected component is then decomposed into a purely local shock ($e_{c,t}$) and a reaction to euro area news ($\varepsilon_{eu,t}$) as well as world (US) news ($\varepsilon_{us,t}$):

$$\varepsilon_{c,t} = e_{c,t} + \beta_{c,t}^{eu} \varepsilon_{eu,t} + \beta_{c,t}^{us} \varepsilon_{us,t} \quad (8)$$

where β represents the country-dependent sensitivity to euro area and US market changes

3 This indicator is based on an approach presented by K. Adjaouté, and J.-P. Danthine (2003), "European financial integration and equity returns: a theory-based assessment", in V. Gaspar, P. Hartmann and O. Sleijpen (eds. 2002). "The transformation of the European financial system".

4 The expected return is obtained relating euro area and US returns to a constant term and to the returns in the previous period. The conditional variance of the error terms is governed by a bivariate asymmetric GARCH (1,1) model.

(of the unexpected component of equity returns), respectively.

$$VR_{c,t}^{eu} = \frac{(\beta_t^{eu})^2 \sigma_{eu,t}^2}{\sigma_{c,t}^2} \quad (10)$$

In order to investigate the development of the betas over time, three dummy variables are introduced for the periods 1986-1992, 1992-1998, and 1998-2005.

For each period, the indicators report the unweighted average intensity with which euro area-wide equity market shocks, other than those from the United States, are transmitted to local euro area equity markets and the unweighted average intensity with which US equity market shocks are transmitted to local euro area equity markets.

Data refer to the EMU global sector indices and are calculated on a weekly basis from January 1973 onwards.

ADDITIONAL INFORMATION

To be able to distinguish global shocks from purely euro area shocks, it is assumed that euro area equity market developments are partly driven by events in the US market. It is furthermore assumed that the proportion of local returns not explained by common factors is entirely due to local news.

Proportion of variance in local equity returns explained by euro area and US shocks (indicator 14)

COMPILATION

To compare the relevance of euro area and US shocks across average changes in country returns, the indicators report the variance ratios, i.e. the proportion of total domestic equity volatility explained by euro area and US shocks, respectively. The indicator is derived by assuming that the total variance in individual country-specific returns is given by

$$\sigma_{c,t}^2 = h_{c,t} + (\beta_t^{eu})^2 \sigma_{eu,t}^2 + (\beta_t^{us})^2 \sigma_{us,t}^2 \quad (9)$$

where $h_{c,t}$ is the variance of the local shock component. The euro area variance ratio is then given by

and correspondingly for the US. The conditional variances are obtained from a standard asymmetric GARCH (1,1) model.

For each period, the indicators report the unweighted average of the relative importance of euro area-wide factors, other than US equity market shocks, for the variance in individual euro-area countries' equity market returns ("variance ratio"), and the unweighted average of the relative importance of US equity market shocks for the variance in euro area equity markets returns.

Data refer to the EMU global sector indices and are calculated on a weekly basis from January 1973 onwards.

ADDITIONAL INFORMATION

The variance ratio is derived assuming that local shocks are uncorrelated across countries and that they are also not correlated with the euro area and US benchmark indices.

BANKING MARKET INDICATORS (INDICATORS 15-20)

Cross-country standard deviations of Monetary Financial Institutions (MFI) interest rates (indicators 15-16)

COMPILATION

The price measures for credit market integration are based on MFI interest rates (MIR) on new business reported to the ECB (in accordance with the Regulation ECB/2001/18), at a monthly frequency as from January 2003.

In detail, the following instrument categories are considered:

- loans to non-financial corporations other than bank overdrafts, with a floating rate and up to one year of initial rate fixation;

- medium- and long-term loans to non-financial corporations, i.e. loans with over one year of initial rate fixation;
- consumer loans to households;
- housing loans to households; and
- time deposits, i.e. deposits by households and non-financial corporations with an agreed maturity.

For the purpose of measuring financial integration, it would be preferable to compute the dispersion of rates as measured by the standard deviation using unweighted interest rates at the level of individual monetary financial institutions. However, these data are not available at the ECB and, therefore, weighted rates and standard deviations are calculated instead.

The following general notation is used for each of the above categories of loans or deposits:

$r_{c,t}$ = the interest rate prevailing in country c in month t ,

$b_{c,t}$ = business volume in country c corresponding to $r_{c,t}$.

$w_{c,t} = \frac{b_{c,t}}{B_t}$ is the weight of country c in the total euro area business volume B : $B_t = \sum_c b_{c,t}$

The euro area MFI interest rate is computed as the weighted average of country interest rates $r_{c,t}$ taking the country weights $w_{c,t}$

$$r_t = \sum_c w_{c,t} r_{c,t} \quad (11)$$

The euro area weighted standard deviation takes the following form:

$$M = \sqrt{\sum_c (r_{c,t} - r_t)^2 w_{c,t}} \quad (12)$$

ADDITIONAL INFORMATION

Since the harmonised MFI interest rates have only recently been established and a long time-

series is not yet available, the time horizon is too short to make a meaningful analysis over time (less than two and a half years of monthly observations are available at present). This is also the reason for not having smoothed the data. Work is currently underway to estimate historical data for MFI interest rates so as to be able to show the evolution of financial integration on the basis of these indicators over a longer period.

Cross-border loans and securities holdings (indicators 17-20)

COMPILATION

These indicators display the geographical counterparty diversification of loans granted by euro area MFIs (excluding central banks) to non-MFI counterparties and other MFIs, respectively, that is, within the same country (domestic), other euro area countries, non euro area EU Member States⁵ and the rest of the world. Similar indicators are computed for securities held by euro area MFIs and issued by non-MFIs and MFIs, respectively.

ADDITIONAL INFORMATION

These four indicators are built on the basis of the national aggregated MFI balance sheet data reported to the ECB, at a monthly and quarterly frequency (in accordance with Regulation ECB/2001/13).⁶

These balance-sheet items are transmitted on a non-consolidated basis. This means that the transactions with foreign counterparties include those with foreign-controlled branches and subsidiaries.

5 Since May 2004, the group has comprised Denmark, Sweden, the United Kingdom and the new EU Members States. Between January 2001 and May 2004, Denmark, Sweden and the United Kingdom formed this group while, before January 2001, Greece was also included.

6 These data cover the MFI sector excluding the Eurosystem and also include data on money market funds (MMFs). The derivation of indicators strictly referring to banking markets is not yet possible. Consequently, as MMFs typically invest in inter-MFI deposits and short-term securities, three of the four indicators considered are somewhat affected by the MMFs balance sheet items. Only for the indicator showing loans to non-MFIs, MFI and credit institutions data coincide.

